mm thick and 80 ppi (32 pores per cm) cell size, is loaded with nickel/silicone coated granules in the size range 75–152 microns. The granules were prepared by coating INCO nickel powder type 287 with ALFAS INDUSTRIES RTV silicone type A2000 in the proportions 8/1 by weight using rotary ablation. The granules were sieved to size and rubbed into the foam until they appeared on the underside of the foam which is an indication of correct filling. The foam held 75 mg of granules per cm^2, corresponding to 1875 mg/cm^3 on average through the foam after compression and about 2500 mg/cm^3 in the fully loaded stratum constituting the element. The foam containing the granules was compressed between metal sheets and heated in an oven at 120C for 30 min. This process produced a very pliable pressure sensitive structure 0.4 mm thick, which has a resistance range of more than 10^{12} ohms across the thickness and which could be proportionally controlled down to less than one ohm using only finger pressure.

Referring to the figures generally:

the words 'upper' and 'lower' relate only to positioning on the drawings, without limitation to disposition when in use;

the circular shape of the components is illustrative only and other shapes will be chosen to suit intended use; for example a rectangular shape would be appropriate for a contacting head in the third aspect of the invention to provide a path for circulation of a fluid test specimen.

Referring to FIG. **1**, the variable resistor comprises external connection means comprising electrodes **10** from which extend external connectors not shown. Electrodes **10** are bridged by element **14** consisting of nickel/silicone-carrying foam as described in the Example above. Lower electrode **10** is supported on solid base **16**. Upper electrode **10** is movable downwards to compress element **14**, under the action of means **18** indicated generally by arrows and capable of action over part or all of the area of electrode **10**. It would of course be possible to apply means **18** also to the lower electrode. Electrode **10** may be a distinct member made of hard material such as metallic copper or platinum-coated brass: in that event the action over part of the electrode area may be for example by sloping the application of means **18** to electrode **10**, or by using an element **14** of graded thickness. Alternatively electrode **10** may be flexible, for example metal foil, metal-coated cloth, organically conductive polymer, or, in a preferred switch, a coherent coating of conductive metal on the upper and/or lower surface of element **14**. Such a coating may be provided by application of metal-rich paint such as silver paint. In this variable resistor, element **14** may structurally be based on any other material having appropriate interstices, for example on a thick-weave polyester cloth such as cavalry twill or on worsted.

Referring to FIG. **2**, the general construction of the variable resistor is the same as in FIG. **1**, but three variants **2***a*–**2***c* of the element are presented.

In variant **2***a* the element, numbered **22**, carries carbon throughout its volume **22**+**24** and nickel/silicone granules only in central region **24**. When the switch is quiescent, with no stress applied by means **18**, it permits the passage of a small current by the weak conductance of the carbon, thus providing a 'start-resistance' or 'start-conductance'. When stress is applied by means **18**, the strong conductance of the nickel/silicone composition comes into play, to an extent depending on the area over which such stress is applied, as well as on the extent of compression of the composition if it has this property.

Variants **2***b* and **2***c* show combinations of the element with a matching layer of non-conductive or weakly conductive material.

In variant **2***b* the element, numbered **34**, is provided by the nickel/silicone-carrying upper part of a block of foam or textile, the lower part being a non-conductive or (e.g. as in **2***a*) weakly conductive layer. This combination is made by applying nickel/silicone as powder or liquid suspension preferentially to one side of the block. The boundary between the element and the layer need not be sharp.

In variant **2***c* the element, numbered **34**, may carry nickel/silicone uniformly or gradedly, but the layer, numbered **38**, is a distinct member and may, in the assembled switch, be adhered or mechanically held in contact with element **34**. This has the advantage over **2***b* that the layer may be structurally different from the element, eg:

element layer

collapsed foam non-collapsed foam

. . . woven cloth

. . . net

collapsed cloth non-collapsed cloth

Referring to FIGS. **3***a* and **3***b*, the element comprises a block **314** of foam carrying nickel/silicone and having external connecting conductors **313** embedded in it. The element may be brought to conductance by compressing a region between conductors **313** by downward action of shoe **316**, which may have an oblique lower end so that its area of application to the element depends on the extent of its downward movement. Instead or in addition, shoe **316** may comprise a plurality of members individually controllable to permit a desired aggregate area of application. In a miniaturised variable resistor shoe **316** may be a dot-matrix or piezo-electric mechanism. The embedded conductors may be made of ohmic material, or can be tracks of metal/polymer composition, for example nickel/silicone, made permanently conductive by local compression by for example shrinkage or stitching. If the embedded conductors are produced by localised compression, this may be effected in a relatively thin sheet of element, whereafter a further sheet of element may be sandwiched about that thin sheet.

A variable resistor as in FIG. **3***a*, when used as a sensor according to the third aspect of the invention, may conveniently form part of a static system in which it is immersed in a fluid specimen, as well as being usable in a flow system.

The variable resistor shown in FIG. **3***b* is a hybrid using the mechanisms of FIG. **1** and FIG. **3***a*. It is more sensitive than the variable resistor of FIG. **3***a*. When compression is applied at **18**, conduction between conductors **313** can take place also via electrode **10**.

Referring to FIGS. **4**, **4***a* shows a variable resistor that is effectively two FIG. **1** variable resistors back to back. The arrangement of two variable resistance outputs from a single input is provided much more compactly than when using conventional variable resistor components. The FIG. **4***a* combination when used in a sensor may provide a test reading and blank reading side-by-side. FIG. **4***b* shows an arrangement in which two separate variable resistors each as FIG. **1** are electrically insulated from each other by block **20**. In **4***a* and **4***b* the variants in FIGS. **2** and **3** may be used. Such combinations are examples of compact multi-functional control means affording new possibilities in the design of electrical apparatus. In a simple example, the **4***b* arrangement could provide an on/off switch and volume control operated by a single button.

What is claimed is:

1. A variable electrical conductance composite having a first level of electrical conductance when quiescent and a second level of conductance upon change of mechanical or electrical stress applied to said composite, said composite